

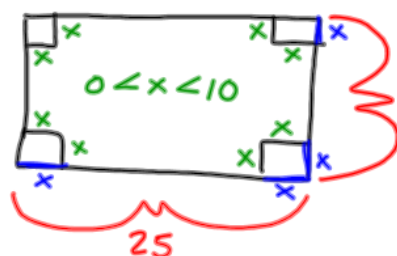
2/1/18

"The most difficult thing is the decision to act, the rest is merely tenacity."-Emelia Earhart

HW: "Optimization Packet" Page 117 #1
Test 1 on Thursday 2/15

AIM: Optimization Continued

HW: Page 122 #2



Max:

$$V = L \cdot W \cdot H$$

$$V = (20-2x)(25-2x)x$$

$$V = (500 - 40x - 50x + 4x^2)x$$

$$V = 500x - 90x^2 + 4x^3$$

$$\begin{aligned} 0 &= 500 - 180x + 12x^2 \\ &= 12x^2 - 180x + 500 \\ &= 4(3x^2 - 45x + 125) \end{aligned}$$

$$V' = 500 - 180x + 12x^2$$

$$x = \frac{45 \pm \sqrt{(-45)^2 - 4(3)(125)}}{2(3)}$$

$$x = 11.319 \text{ and } 3.681$$

reject



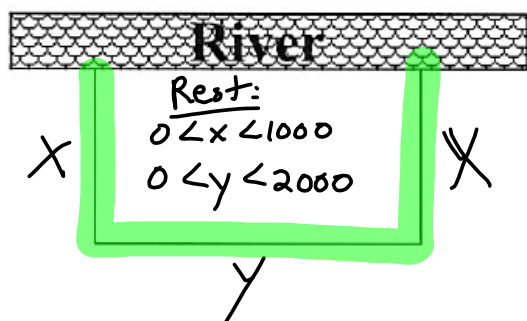
The squares should have sides of 3.681 in

The Volume is : $500(3.681) - 90(3.681)^2 + 4(3.681)^3$

$$V = 820.528 \text{ in}^3$$

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4. A farmer has 2,000 feet of fencing to enclose a pasture area. The field will be in the shape of a rectangle and will be placed against a river where there is no fencing needed. What is the largest area field that can be created and what are its dimensions?



Primary

$$\text{Area} = xy$$

Secondary

$$2000 = 2x + y$$

$$2000 - 2x = y$$

$$\text{Area} = x(2000 - 2x)$$

$$A = 2000x - 2x^2$$

$$A' = 2000 - 4x$$

$$0 = 2000 - 4x$$

$$4x = 2000$$

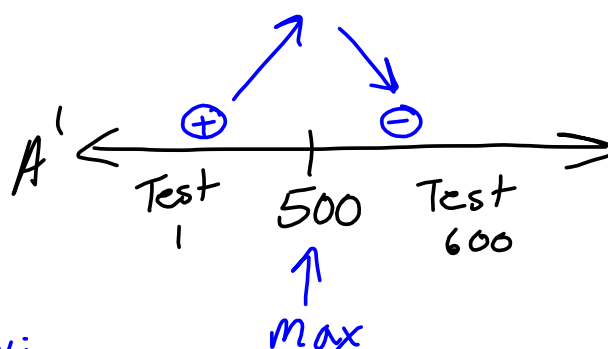
$$x = 500$$

Find y:
 $x = 500$

$$y + 2(500) = 2000$$

$$y + 1000 = 2000$$

$$y = 1000$$



$$x = 500 \text{ ft}$$

$$y = 1000 \text{ ft}$$

$$\text{Max Area} = 500(1000) = 500,000 \text{ ft}^2$$

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Example 1) A trucking company has determined that the cost per hour to operate a single truck is given by $C(s) = 0.0001s^2 - 0.01s + 12$ where s is the speed that the truck travels. At what speed is the total cost per hour a minimum? What is the hourly cost to operate the truck?

Primary:

$$C(s) = .0001s^2 - .01s + 12$$

$$C' = .0002s - .01$$

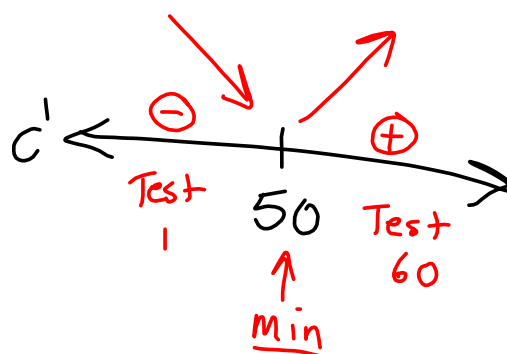
$$0 = .0002s - .01$$

$$.01 = .0002s$$

$$50 = s$$

Restrictions:

$$s \geq 0$$



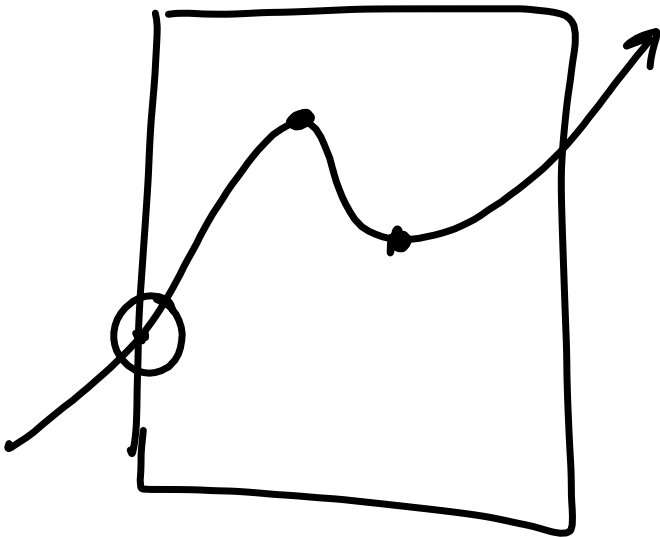
Because we have
a closed interval we need to
check $s=0$ also.

$$C(0) = .0001(0)^2 - .01(0) + 12 = \$12$$

$$C(50) = .0001(50)^2 - .01(50) + 12 = \$11.75$$

50 mph

hourly cost = \$11.75



2. The sum of two positive numbers is 48. What is the smallest possible value of the sum of their squares?